

developing in one half of the uterus while the other lay dormant or developed more slowly in the other half during the months necessary to account for the delay in birth?

Male No. 22 is still living, and is a typical *Macropus rufus*.

PAPERS.

16. Report on the Deaths which occurred in the Zoological Gardens during 1911. By H. G. PLIMMER, F.R.S., F.Z.S., Pathologist to the Society.

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On January 1st, 1911, the number of animals in the Zoological Gardens was 3184, and during the year 3493 animals were admitted, making a total of 6677 for the year.

The number of deaths during the year has been 1647—that is, a death-rate of 24·6 per cent.; but if from the above total we deduct 801 animals which did not live for six months after their arrival in the Gardens—that is, the time at which we find they have either got over their journeys, or died from any disease they brought with them, or have got fairly used to their new environment—the percentage of deaths is reduced to 12·6, which is considerably less than those of the past three years.

The following figures will show the general results of the last four years:—

	1908.	1909.	1910.	1911.
Total number of animals	5608	5303	5540	6677
Total deaths	1737	1492	1554	1647
Percentage of total deaths	31	28	28	24·6
Percentage of deaths, excluding those which occurred in animals which had <i>not</i> been six months in the Gardens	17	17·8	16·4	12·6

In any case the figures for 1911 show a considerable improvement on those of the last three years, and if the relative numbers be borne in mind, the improvement is much more marked.

The total deaths are divided as follows: Mammals 359, Birds 849, Reptiles 439.

The following tables show the facts ascertained in outline. Table I. sets forth the actual causes of death in each of the three groups specified. Under Reptiles are included Amphibia.

TABLE I.—Analysis of the Causes of Death.

Diseases.	Mammals.	Birds.	Reptiles.	Reference to Notes following.
1. Microbic or Parasitic Diseases.				
Tuberculosis	18	106	23	1
Mycosis	3	103	...	2
Pneumonia	48	81	93	3
Septicæmia	3	...	...	4
Abscess	1	1	1	...
Pericarditis	8	3	1	5
Peritonitis	3	...	...	...
Stomatitis .....	...	...	4	...
Pleuritis	2	...	...	...
Distomiasis	1	...	...	6
Hydatids	3	...	...	...
Worms .....	...	3	7	7
Hæmogregarines .....	...	...	6	...
Malaria .....	...	1	...	...
Cystitis	1	...	...	...
2. Diseases of Respiratory Organs.				
Broncho-pneumonia	41	...	...	8
Congestion of lungs	27	106	23	9
Atelectasis	2	...	...	...
Bronchitis	4	...	...	...
3. Diseases of the Heart.				
Fatty degeneration	2	4	2	...
4. Diseases of the Liver.				
Fatty degeneration	3	22	5	...
Hepatitis	2	5	...	...
Cirrhosis	1	...	...	...
Angioma	1	1	...	...
5. Diseases of Alimentary Tract.				
Gastritis .....	...	1	1	...
Gastric ulceration	8	...	1	...
Gastro-enteritis	15	6	16	10
Enteritis	39	214	20	11
Intussusception	2	...	1	...
Intestinal obstruction	1	1	1	...
6. Diseases of Urinary Organs.				
Nephritis	48	33	8	...
Fibrosis of kidneys	3	8	...	...
Stone	2	...	...	12
Inflammation of oviduct .....	...	2	...	...
7. Various.				
Carcinoma	2	...	1	13
Sarcoma .....	...	2	...	14
Senile Decay	2	...	...	...
Anæmia without ascertained } cause	1	...	3	...
Injuries discovered <i>post-</i> } <i>mortem</i>	6	5	2	...

Besides those tabulated above,

120 animals were killed by order or by companions,

151 „ died of malnutrition and starvation,

1 animal was not examined,

138 animals were too stale for detailed examination,

these completing the total.

In Table I. the classification is made into those diseases which actually caused the death of the animals, but in a large number of the Mammals, Birds, and Reptiles other lesions were present which helped towards the fatal issue, and these are classified in Table II. If this Table be taken together with Table I. a much more accurate estimate of the amount of disease in the Gardens will be arrived at.

TABLE II.—Other Diseases found in the animals tabulated in Table I.

Diseases.	Mammals.	Birds.	Reptiles.	Reference to Notes following.
Tuberculosis	10	7	...	
Mycosis .....	...	7	...	
Pneumonia	5	2	4	
Empyema	1	...	...
Pericarditis	5	4	...	
Peritonitis	3	...	...
Pleuritis	1	...	...
Pancreatitis .....	...	4	...	
Malaria .....	...	28	2	15
Filariæ	1	30	1	
Worms	12	13	17	
Hæmogregarines .....	...	...	22	
Trypanosomes	1	1	
Stomatitis	1	...	4	
Abscess	5	2	1	
Splenic infarcts	5	
Cystitis	3	
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Bronchitis	1	
Broncho-pneumonia	6	...	1	
Congestion of lungs	20	68	9	
Edema of lungs	4	39	25	
Emphysema	2	...	...
Hydrothorax	4	...	...
Dilated heart	21	9	1	
Atheroma	3	3	...	
Fatty liver	13	57	23	
Hepatitis .....	...	11	...	
Gastritis	3	...	...
Gastric ulceration	23	2	3	
Enteritis	21	43	18	
Intussusception	8	1	1	
Nephritis	20	15	2	
Fibrosis of kidneys	4	16	3	
Cystic kidneys	1	...	...
Ascites	4	4	11	
Tumours	3	...	...
Myelitis	2	...	...
Rickets	24	5	...	
Fat embolism .....	...	...	1	16

TABLE III.—Shows the Distribution of Diseases causing Death amongst the principal Orders of Mammals.

Diseases.	Primates.	Carnivora.	Rodentia.	Ungulata.	Edentata.	Marsupialia.
Tuberculosis.....	7	6	2	2	...	1
Mycosis.....	...	...	...	...	...	3
Pneumonia.....	14	17	7	7	2	1
Septicæmia.....	1	2	...	...	...	...
Abscess.....	...	...	...	1	...	...
Pericarditis.....	2	4	1	...	...	1
Peritonitis.....	...	...	...	3	...	...
Pleuritis.....	1	1	...	...	...	...
Distomiasis.....	...	...	...	1	...	...
Hydatids.....	2	...	...	1	...	...
Cystitis.....	...	...	1	...	...	...
Broncho-pneumonia.....	17	10	7	5	2	...
Congestion of lungs.....	14	2	8	3	...	...
Atelectasis.....	...	1	...	1	...	...
Bronchitis.....	3	...	...	...	1	...
Fatty heart.....	1	1	...	...	...	...
Fatty liver.....	1	1	1	...	...	...
Hepatitis.....	...	...	2	...	...	...
Cirrhosis of liver.....	...	...	...	1	...	...
Angioma of liver.....	1	...	...	...	...	...
Gastric ulceration.....	3	4	...	...	...	1
Gastro-enteritis.....	3	7	3	1	...	1
Enteritis.....	19	9	4	4	1	2
Intussusception.....	1	...	1	...	...	...
Intestinal obstruction.....	...	1	...	...	...	...
Nephritis.....	12	14	10	7	1	4
Fibrosis of kidneys.....	...	2	1	...	...	...
Stone.....	...	1	...	...	...	1
Carcinoma.....	...	...	...	...	...	2
Senile decay.....	...	...	...	2	...	...
Anæmia.....	...	1	...	...	...	...
Injuries.....	...	2	...	1	...	3

*Notes on the foregoing Tables.*I. *General.*

The following calculations will show better what the figures on page 235 mean. On the average of the past three years, *taking into consideration the different numbers of animals in each year*, the figures for 1911 should have been, roughly:—

Total deaths.....	2020
Percentage of total deaths.....	36
Ditto, excluding those animals which had not been six months in the Gardens.....	20

So that the improvement is really much greater than appears from the mere figure-statement.

The principal percentage improvement is in the Mammals, which come out for 1911, as compared with the three previous years, roughly as 22 is to 31.

The following table shows the deaths amongst the Mammals from the numerically most important diseases for the four years 1908-1911 :—

	1908.	1909.	1910.	1911.
<i>Total number of animals ...</i>	5608	5303	5540	6677
Tuberculosis	59	17	18	18
Pneumonia	47	43	31	48
Septicæmia	12	15	7	3
Broncho-pneumonia	44	51	50	41
Congestion of lungs	29	38	41	27
Gastro-enteritis	23	11	19	15
Enteritis.....	72	46	32	39
Peritonitis	15	4	6	3

The Birds do not show any percentage reduction of mortality; and the great relative mortality of birds in the Gardens is due, in my opinion, largely to the overcrowding of many of the aviaries.

The Reptiles show the largest percentage mortality; this is, in my opinion, partly due to the fact that so many of them arrive heavily laden with parasites of all sorts—some having as many as four different species—and partly to the present unsatisfactory method of feeding them.

II. *Special.*

1. The percentage of tubercle has fallen to 7·8 per cent. in the Mammals, 13·3 per cent. in the Birds, and is 5·4 per cent. in the Reptiles, which is relatively less than last year all round.

In 6 Mammals and 41 birds it was a general tuberculosis. In a Lion it was of the human type with cavitation of lungs, and in 7 Birds it was of bovine type.

A remarkable case occurred in a young Duck three weeks old, in which the lungs, air-sacs, and kidneys were affected, and the growths were already caseating.

2. As before, all the mould-diseases are grouped here. In the Mammals—2 Wallabies and a Kangaroo—it was of the same type as described before, and due to the same organism. The percentage among the Birds remains unchanged: three cases were due to *Aspergillus niger*.

3. The deaths from pneumonia still remain very high, roughly about the same percentage as last year. My impression, from the *post mortems*, is that it is becoming more virulent in the Gardens: there have been more secondary pneumococcal affections,

such as enteritis, nephritis, and gastric ulceration. Many of the Mammals were very rickety and so predisposed. In three of the Reptiles it was due to worms: in all the other cases pneumococcal.

4. One, in a Japanese Ape, was due to pyorrhœa alveolaris: the other two to deep abscesses.

5. Eight of these cases were due to pneumococcal infection.

6. In an Anoa, in which the liver was crammed with flukes.

7. The three birds had all syngamus.

8. Two of these were influenzal, and five had rickets.

9. Nine of the Mammals were badly rickety: in the Birds there was also, in most cases, œdema of the lungs.

There has been a notable decrease of this condition in the Mammals and Birds.

10. The cause of this condition has been traced definitely in one instance, separately to shot, straw, grass, in two to sand, and in seven to worms.

11. The number of cases of enteritis is relatively about the same as last year. In the following instances the cause could be definitely traced: 15 were due to worms, 3 to flukes, 11 to decomposed food, 14 to sand, and 6 to foreign bodies.

12. This occurred in a Fox and a Tasmanian Devil.

13. The two cases in Mammals were in a Wallaroo and in a Kangaroo; in both the primary growth was in the stomach: in the former there were secondary deposits in glands and colon, and in the latter in liver and glands. The reptilian case was a glandular cancer in the stomach of a Tortoise.

14. The two cases of sarcoma in Birds were in a Vulture and a Parrakeet respectively: in the former in liver, pericardium, and heart, and in the latter in the kidney.

15. The diseases grouped under the term "Malaria" were due in the greater number of instances to the *Hæmoproteus danilewski*, in the others to the *Plasmodium præcox*.

16. This occurred in an Alligator after a compound fracture of the thigh.